

5-YEAR REVIEW

Short Form Summary

Species Reviewed: *Neraudia angulata* (No common name)

Current Classification: Endangered

FR Notice announcing initiation of this review:

U.S. Fish and Wildlife Service (USFWS). 2006. Endangered and threatened wildlife and plants; initiation of 5-year reviews of 70 species in Idaho, Oregon, Washington, Hawaii, and Guam. Federal Register 71(69):18345-18348.

Lead Region/Field Office:

Region 1

Pacific Islands Fish and Wildlife Office, Gina Shultz, Assistant Field Supervisor
Endangered Species

Name of Reviewer(s):

Marie Bruegmann, Pacific Islands Fish and Wildlife Office, Plant Recovery Coordinator
Marilet A. Zablan, Pacific Islands Fish and Wildlife Office, Recovery Program Leader
and Acting Assistant Field Supervisor for Endangered Species

Methodology used to complete this 5-year review:

This review was based on the final critical habitat designation for *Neraudia angulata* and other species from the island of Oahu, as well as a review of current, available information. The National Tropical Botanical Garden, subcontracted by the Hawaii Biodiversity and Mapping Program, provided an initial draft of portions of the 5-year review.

Background:

For information regarding the species listing history and other facts, please refer to the Threatened and Endangered Species System (TESS) which is part of the Fish and Wildlife Service's Environmental Conservation On-line System (ECOS) database.

Application of the 1996 Distinct Population Segment (DPS) Policy:

This Policy does not apply to plants.

Review Analysis:

Please refer to the final critical habitat nondesignation for *Neraudia angulata* published in the Federal Register on June 17, 2003 (USFWS 2003) for a complete review of the species' status (including biology and habitat), threats, and management efforts. No new threats and no significant new information regarding the species biological status have come to light since listing to warrant a change in the Federal listing status of *N. angulata*.

At the time of listing, 15 individuals were known from five populations (USFWS 1996). *Neraudia angulata* has two varieties: var. *angulata* and var. *dentata*, although populations that appear to be intermediate between the two varieties are also known.

Populations considered to be *N. angulata*: var. *angulata* include: 4 mature individuals at Leeward Puu Kaua; 16 mature and 1 immature individuals at Makaha; 40 mature and 6 immature naturally occurring individuals, and 4 mature outplanted individuals at Makua, 46 mature, 35 immature, and 25 seedlings at Waianae Kai Makai. The 2 mature individuals at Kapuna Gulch and the 1 mature individual at Punapokahu are considered to be *N. angulata* var. *dentata*. The 57 mature, 26 immature, and 54 seedlings at Waianae Kai Mauka and the 30 mature and 4 immature individuals at Halona (Lualualei) appear to be an intermediate form between *N. angulata*: var. *angulata* and *N. angulata*: var. *dentata*. In addition, the U.S. Army has reintroduced 27 mature individuals to Kaluakauila. In total, the 9 populations contain 227 mature individuals, 74 immature individuals, and 79 seedlings (U.S. Army 2006). However, *N. angulata* tends to fluctuate widely in numbers from year to year, so the number of individuals given here should not be considered stable (Makua Implementation Team 2003).

Fire is the major threat to *Neraudia angulata* (Factor E). Fires have destroyed and damaged habitat in the Makua area, in Kapuna Gulch and in Kahanahaiki. About 32 individuals occur in the high fire risk zone and 48 in the very low fire risk zone within the action area for the Makua Military Reservation. The individuals in the high fire risk zone represent about eight percent of the species' total numbers (USFWS 2007). Other threats to *N. angulata* include feral goats (*Capra hircus*) and pigs (*Sus scrofa*) (Factors A and D); and invasive introduced plant species (Factor E), including *Schinus terebinthifolius* (Christmasberry), *Ageratina riparia* (spreading mist flower), *Leucaena leucocephala* (haole koa), *Panicum maximum* (Guinea grass), *Passiflora suberosa* (huehue haole), *Psidium cattleianum* (strawberry guava), *Morella faya* (firetree), *Grevillea robusta* (silk oak), *Schefflera actinophylla* (octopus tree), *Syzygium cumini* (Java plum), *Oplismenus hirtellus* (basketgrass), and *Psidium guajava* (common guava) (Perlman 2007). Habitat in lower elevations of the Waianae Mountains was heavily grazed in the 1800's and early 1900's, and while some of these lands are no longer grazed, on others cattle (*Bos taurus*) continue to impact the species (Makua Implementation Team 2003). Slugs and rats (Factor C) are reported to be threats to this species (Perlman 2007).

Three populations are protected from feral ungulates completely, and another three populations are partially protected. Invasive plant control is ongoing at three populations, and rat control occurs at one population (U.S. Army 2006). Thousands of seeds are in genetic storage, and additional material is being cultivated for reintroduction efforts (U.S. Army 2006; Harold L. Lyon Arboretum Micropropagation Laboratory 2007; Center for Conservation and Research Training Seed Storage Laboratory 2007).

Stabilizing, downlisting, and delisting objectives are provided in the recovery plan for plants from the island of Oahu (USFWS 1998), based on whether the species is an annual, a short-lived perennial (fewer than 10 years), or a long-lived perennial. *Neraudia angulata* is a short-lived perennial, and to be considered stable, the taxon must be managed to control threats (e.g., fenced) and be represented in an *ex situ* (at other than the plant's natural location, such as a nursery or arboretum) collection. In addition, a minimum of three populations should be documented on the island of Oahu. Each of

these populations must be naturally reproducing and increasing in number, with a minimum of 50 mature individuals per population.

The stabilization goals for this species have not been met (see Table 1), as only one population has more than 50 mature individuals and not all threats are being managed. Therefore, *Neraudia angulata* meets the definition of endangered as it remains in danger of extinction throughout its range.

Recommendations for Future Actions:

- Develop fire management plans, to include fuel load reduction, for those populations at risk of fire.
- Continue fencing populations to reduce impacts from feral goats and pigs.
- Control invasive introduced plant species within exclosures.
- Study populations with regard to population size and structure, geographical distribution, flowering cycles, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, limiting factors, and threats.
- Research taxonomic validity of varieties of *Neraudia angulata*.

References:

Center for Conservation and Research Training Seed Storage Laboratory. 2007. Database Unpublished.

Harold L. Lyon Arboretum Micropropagation Laboratory. 2007. Database. Unpublished.

Makua Implementation Team. 2003. Implementation Plan for the Makua Military Reservation, Island of Oahu. Prepared for U.S. Army Garrison, Hawaii, May 2003. Unpublished.

Perlman, Steve. 2007. National Tropical Botanical Garden, summary of field notes for *Neraudia angulata*. Unpublished.

[U.S. Army] U.S. Army Garrison, Hawaii. 2006. 2006 Status reports for the Makua implementation plan and the draft O`ahu implementation plan. Unpublished.

[USFWS] U.S. Fish and Wildlife Service. 2007. Reinitiation of the biological opinion of the U.S. Fish and Wildlife Service for military training at Makua Military Reservation. June 22, 2007. Unpublished.

[USFWS] U.S. Fish and Wildlife Service. 2003. Endangered and threatened wildlife and plants; final designations or nondesignations of critical habitat for 101 plant species from the island of Oahu, Hawaii; final rule. Federal Register 68(116):35950-35993.

[USFWS] U.S. Fish and Wildlife Service. 1998. Recovery plan for the Oahu plants. Portland, Oregon. 207 pages + appendixes.

[USFWS] U.S. Fish and Wildlife Service. 1996. Determination of endangered status for twenty-five plant species from the Island of Oahu, HI; final rule. Federal Register 61(198):53089-53108.

Table 1. Status of *Neraudia angulata* from listing through 5-year review.

Date	No. wild indivs	No. outplanted	Stability Criteria identified in Recovery Plan	Stability Criteria Completed?
1996 – listing	15	0	All threats managed in all 3 populations	No
			Complete genetic storage	No
			3 populations with 50 mature individuals each	No
1998 – recovery plan	70-100	0	All threats managed in all 3 populations	No
			Complete genetic storage	Partial
			3 populations with 50 mature individuals each	No
2003 – critical habitat	69-80	12	All threats managed in all 3 populations	Partial
			Complete genetic storage	Partial
			3 populations with 50 mature individuals each	No
2007 – 5-yr review	353	27	All threats managed	Partial
			Complete genetic storage	Partial
			3 populations with 50 mature individuals each	Partial, 1 population only


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SIGNATURE PAGE for 5-YEAR REVIEW on *Neraudia angulata*

Pre-1996 DPS listing still considered a listable entity? N/A

Recommendation resulting from the 5-year review:

 Delisting
 Reclassify from Endangered to Threatened status
 Reclassify from Threatened to Endangered status
 X No Change in listing status

Field Supervisor, Fish and Wildlife Service

Approve 

Date 1/18/08